(UOP) Remedial Investigation Report for Area 4, UOP Site, East Rutherford, NJ ENSR Consulting + Engineering. April 1990.

2. BACKGROUND INFORMATION

2.1 Site Description

The UOP site comprises 75 acres in East Rutherford, New Jersey (Figure 1-1). It is bounded on the north primarily by a compressed gas facility and a metal finishing company, on the east by Berrys Creek, on the south by commercial properties, and on the west by New Jersey Route 17. The property is flat and substantial portions are covered by tidal salt marsh. A system of natural and artificial surface-water channels crosses the property to allow drainage; this system is tidal and flows into Berry's Creek, a tributary of the Hackensack River. Berry's Creek is rated as Class FW2-NT/SE2, indicating that the waters should be capable of maintaining fish and other wildlife populations.

The property was developed in 1932 by Trubeck Laboratories, which built an aroma chemicals laboratory. In 1956, Trubeck constructed a waste treatment plant for the treatment of wastes generated at the facility. In 1959, Trubeck constructed two wastewater holding lagoons to receive water from the on-site waste water treatment system. UOP Inc. acquired the property and facilities in 1960 to diversify its activities into the chemical products area. The use of the on-site waste treatment system, including the lagoons, was discontinued in 1971 when the plant was connected to the municipal sewer system. UOP Inc. terminated operations in 1979, and all structures, except concrete slabs and a pipe bridge over the railroad tracks, were demolished during 1980.

The site is part of a well defined area that, because of location, access and zoning, is generally used for similar types of activities throughout. This area is bounded by the following features: Paterson-Plank Road to the north, Route 17 to the west, Berry's Creek to the east, and Route 3 to the south.

Developed property in this area is predominantly occupied by large warehouses and small manufacturing facilities. Typically, a property has one or more buildings, large paved areas and in some instances lawns. A high percentage of the properties along Route 17 and Paterson-Plank Road are used by commercial retail businesses. Examples of these uses are: gasoline stations, a building supply store, an automobile dealership, a hotel, office parks, and restaurants.

The above land uses are driven largely by zoning regulations. The site area west of the railroad tracks is within the Borough of East Rutherford's jurisdiction and is zoned I-2, General Industry and Business. The site area east of the railroad tracks is within the Hackensack Meadowlands Development Commission's jurisdiction and is zoned: Light Industrial, A.

Undeveloped portions of the area generally are marshes that are wet and at low elevations. These areas are predominantly thickly vegetated, usually with marsh grass (phragmites). These areas usually remain as marshes due to regulatory restrictions which limit or prevent wetlands development.

2.2 Environmental Setting

2.2.1 Regional Physiography

The Hackensack River Basin in Bergen County, New Jersey, is located within the glaciated portion of the Piedmont Province of the Appalachian Highlands. The UOP site is situated in the Hackensack Valley, which is characterized as a broad lowland bounded on the west by the First Watchung Mountains and to the east by the Palisades Ridge. The lowlands generally show little to no relief and are affected by the tides. The Hackensack River Basin is one of the most heavily urbanized areas in the United States (Carswell, 1976) and includes the largely undeveloped Hackensack Meadowlands of approximately 20 square miles in area.

2.2.2 Site and Regional Topography and Drainage

The UOP property exhibits little relief with an approximate elevation of 4 to 6 feet above mean sea level. In 1980 all buildings and structures were demolished, and only the building foundations remain visible. Approximately one half of the property is composed of construction debris and fill; the remaining sections are low lying wetlands with little relief. The majority of the property is covered with scrub brush and phragmites reeds.

The site drains into Ackerman's Creek which also receives run-off from the surrounding highland areas. Ackerman's Creek runs an irregular course through the western portion of the property, then flows in a straight man-made channel into Berry's Creek, approximately 2,200 feet to the East. Berry's Creek drains into the Hackensack River approximately three miles to the south.

The Hackensack River's other major tributaries are the Pascack Brook, Overpeck, Saw Mill and Penhorn Creeks which form the Hackensack River basin. The Hackensack River Basin if 4 to 7 miles wide and approximately 34 miles long with a total drainage area of 202 square miles, 139 square miles within New Jersey. The average annual precipitation for the basin is 45 inches (Carswell, 1976).

2.2.3 Site and Regional Geology

Regionally, the Hackensack River Basin is composed of unconsolidated Quaternary (geologic period) deposits consisting of clays, gravels, sand and silt as well as glacial drift and glacial till. The Quaternary deposits range in depth from 5 to 10 feet in the basin edges to several hundred feet in the center. The bedrock underlying the unconsolidated sediments is the Triassic Age Newark Group (Stockton, Lockatong, and Brunswick/Passaic formations). The bedrock underlying the site is the Passaic Formation. This formation is composed of reddish-brown siltstones, shales and sandstones. Generally the formation strikes north to northeast

with a 10 degree dip to the northwest. This formation is heavily fractured with steeply dipping joints which follow strike. The thickness of the formation is unknown but is believed to extend downward several thousand feet (Herpers & Burksdale, 1951).

The materials in the stream channels identified during the most recent UOP site investigation are recent deposits (Holocene epoch). Soil types encountered include a 3.5- to 4-foot layer of highly organic sediments followed by 1 to 2 feet of loose to medium density clayey silt and 1 to 2 feet of medium dense silty fine sand. The sequence is underlain by a thick very stiff varved clay. Carswell et al (1976) provides subsurface information based on three wells installed on site in the 1950s by Trubek Labs who occupied the site from the 1920s through the 1950s. The information provided indicates that bedrock is present at a depth of approximately 200 feet. Widmer et al. (1959) indicates that the stiff varved clay (encountered during the installation of a Trubek Labs well) which underlies a peat layer, is approximately 120 feet in thickness. For more detailed geologic information, refer to the Remedial Investigation Report for Areas 1, 1A, 2 and 5 of the UOP site (Geraghty & Miller, 1988).

2.2.4 Site Hydrogeology

During several site investigations in the 1980s, 36 monitoring wells were installed in the fill areas and 7 monitoring wells were installed within the two wastewater lagoons. Based on water level measurements collected from many of these wells, ground water is tidally influenced and is hydraulically connected to Ackerman's Creek.

As previously discussed, the site is located in a heavily urbanized area which receives run-off from heavily trafficked roadways and populated areas. Historically, the surface waters in the general area were used to dispose of 57 million gallons per day of treated municipal sewage effluent and industrial waste (Carswell

1976). Ground water extracted from deep within the Quaternary deposits as well as the Passaic formation is used as a potable drinking water source.

2.3 Investigations Summary

Investigation work in the stream channels was performed in several phases from 1983 until 1990. These phases are summarized as follows:

PHASE I

Field Work Performed:	November 1983
Data Developed:	- Surface water flow patterns - Quality of surface water and sediments in onsite stream channels
Report:	"Investigation of Ground-Water Conditions on Universal Oil Products, Inc.'s Site, East Rutherford, New Jersey, May 1984", (Geraghty & Miller, Inc.)

PHASE II

Field Work Performed:	January 1985
Data Developed:	Additional sediment sampling in onsite stream channels
Report:	"Phase II Investigation, Water and Soil Conditions, UOP Site, East Rutherford, New Jersey, May 1985", (Geraghty & Miller, Inc.)

PHASE III

Phase III sampling was performed as a requirement of the May 1986 ACO. The sampling occurred in three parts beginning in 1986

and completed in 1990. Part 1 sampling was performed in October 1986 in accordance with the requirements of the general site Work Plan (Geraghty & Miller, September 1986). The PCB data developed from the sampling event indicated that the contamination was deeper than originally anticipated and there was no significant difference in concentrations across the stream channels. These findings were developed into a revised sediment sampling plan (ERT, April 1987). Implementation of the revised plan was postponed while a remedial action alternative was reviewed by UOP and ERT. Part 2 sampling was performed in October 1987. This sampling event partially completed the April 1987 plan requirements and was performed to provide input to the remedial action alternative being developed. At NJDEP's request, the sampling plan was revised (ENSR, October 1989) and planning for completion of Phase III resumed. The field work for this last portion (Part 3) was performed from November 1989 to January 1990.

Field Work Performed:	Part 1: October 1986 Part 2: October 1987 Part 3: November 1989 to January 1990
Data Developed:	- Additional onsite sediment sampling - Sediment sampling of Berry's Creek - Sediment sampling of channels adjacent to the site
Reports:	Part 1: "Revised Pilot Study Report for McGraw-Edison PCB Field Test Kit", (ERT, January 1987) Part 2: "Conceptual Plan for the Remediation of Ackerman's Creek Sediments", (ERT, February 1988) Part 3: This report

ECOLOGICAL RISK ASSESSMENT

As part of the Ecological Risk Assessment, nine sediment and fish samples were collected from Ackerman's Creek and three samples were collected from a channel on the east side of Berry's Creek. The sediment and fish tissue data were used to assess impacts to site biota. The results of the assessment were used to develop sediment cleanup objectives for Ackerman's Creek.

Field Work Performed:	November 1988	
Data Developed:	- Sediment:	PCBs, mercury, chromium, Total Organic Carbon, Grain Size Distribution
	- Fish Tissue:	PCBs, mercury, chromium
Report:	"Risk Assessment Report, Volume 2," (ENSR, November 1989)	

3. TECHNICAL OVERVIEW

3.1 Areas of Environmental Concern

The investigation of the stream channel sediments and underlying soils includes the channels within the UOP property boundary and channels off the property that are hydraulically connected to the on-site channels. The various channels are shown on Figure 3-1 with the sampling locations used in the November 1989 - January 1990 investigation.

The on-site channels are identified by sampling locations designated with numbers 1BL through 21BL. Locations 1BL-3BL are in a channel referred to as the North Ditch. Locations 4BL through 21BL constitute the longest set of interconnected channels on the site. Lastly, there is a small channel located to the west of the wastewater lagoons.

There are two channels that are upstream from the on-site channels. One is south of the site where 0S1 through 0S7 are located. This channel is connected to the on-site channels through a culvert under the railroad tracks. The other channel is west of Route 17 where 0S8 is located. This channel is believed to be connected by a culvert to the on-site channels.

Berry's Creek, shown on the far right side of Figure 3-1, is downstream from the on-site channels. Water flows back and forth between the on-site channels and Berry's Creek with the tide. Berry's Creek is a much larger waterway than the other channels being studied and receives drainage from many other areas.

In addition to the channel sediment investigation, the marsh lands adjacent to the on-site channels are investigated in this study. The three locations MS1, MS2 and MS3 are located in the marsh areas.

3.2 Field Sampling Program

Sampling was conducted in accordance with the "Stream Channel Sediment Sampling Plan," (ENSR, October 1989). The major components of the plan are summarized in the following sections.

3.2.1 On-Site Stream Channel Sediments

The rationale for the on-site stream channel sampling locations is to delineate the distribution of sediment contamination along the length of the stream channels and vertically into the sediment and underlying soil. Analytical data were to provide information on the anticipated attenuation in contaminant concentrations with depth and the effectiveness of an underlying clay layer which may be acting as an impervious barrier to the vertical migration of contamination.

Noting that contamination can travel both up and downstream in a tidally influenced channel, the boring locations are distributed along the entire length of the on-site channels. Twenty one locations (1BL through 21BL) were sampled within the on-site stream channel sediments (Figure 3-1). Nine locations (1BL through 4BL and 9BL through 13BL) were in the vicinity of previous investigations. It was learned from those investigations that the stream channels in those areas consist of a loose sedimentary layer over a harder stratum consisting primarily of clay. Based on a presumption that contaminant distribution may be different between the two strata, an approach was developed to sample each strata separately. As a result, two samples each were collected from the sediments and underlying soil at each location. The four samples were collected from a single boring as follows:

clayey soil

1. A 12- to 24-inch sediment sample
2. A 12-inch sediment sample above the first observable soil layer

3. A 0- to 12-inch sample in the soil layer
4. A 12- to 24-inch sample in the soil layer.

Samples were collected from the remaining twelve borings at four 12-inch depth intervals below ground surface as follows:

- 0 - 12 inches
- 12 - 24 inches
- 24 - 36 inches
- 36 - 48 inches.

All samples from the twenty-one locations were analyzed for polychlorinated biphenyls (PCBs) and total organic carbon (TOC). In addition, selected samples were analyzed for:

- priority pollutant volatile organic compounds (VOCs) plus quantification and identification of an additional fifteen chromatograph peaks,
- priority pollutant base/neutral extractable organic compounds (B/Ns) plus fifteen peaks,
- total chromium,
- total mercury, and
- grain size distribution.

The analyses performed are summarized in Table 3-1.

3.2.2 Off-Site Stream Channel Sediments

The rationale for the off-site sampling locations is to delineate the extent of contamination that was previously identified in the on-site channels of the UOP site. There are eight off-site sampling locations as shown on Figure 3-1. Seven (OS1-OS7) are situated in the channel located to the south of the railroad tracks which form the southern boundary of the site. This channel is hydraulically connected to Ackerman's Creek by a culvert

TABLE 3-1

ON-SITE SOIL/SEDIMENT ANALYSES

UOP SITE, EAST RUTHERFORD, NEW JERSEY

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
1BL	2	X			X	
	A	X			X	
	B	X			X	
	C	X			X	X
2BL	2	X	X	X	X	X
	A	X		X	X	X
	B	X		X	X	
	C	X	X	X	X	
3BL	2	X			X	
	A	X			X	
	B	X			X	X
	C	X			X	

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
4BL	2	X	X	X	X	X
	A	X		X	X	
	B	X		X	X	
	C	X	X	X	X	X
5BL	1	X			X	
	2	X			X	
	3	X			X	
	4	X			X	X
6BL	1	X			X	
	2	X			X	
	3	X			X	
	4	X			X	

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
7BL	1	X			X	
	2	X			X	
	3	X			X	
	4	X			X	
8BL	1	X			X	X
	2	X			X	
	3	X			X	
	4	X			X	X
9BL	2	X			X	X
	A	X			X	
	B	X			X	
	C	X			X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
10BL	2	X	X	X	X	X
	A	X		X	X	
	B	X		X	X	
	C	X	X	X	X	X
11BL	2	X			X	X
	A	X			X	
	B	X			X	
	C	X			X	X
12BL	2	X			X	
	A	X			X	
	B	X			X	
	C	X			X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
13BL	2	X			X	
	A	X			X	
	B	X			X	
	C	X			X	X
14BL	1	X			X	X
	2	X			X	
	3	X			X	
15BL	1	X	X	X	X	
	2	X		X	X	
	3	X		X	X	
	4	X	X	X	X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
16BL	1	X			X	
	2	X			X	
	3	X			X	
	4	X			X	
17BL	1	X		X	X	
	2	X		X	X	
	3	X		X	X	
	4	X		X	X	X
18BL	1	X		X	X	
	2	X		X	X	
	3	X		X	X	
	4	X		X	X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-1 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
19BL	1	X		X	X	
	2	X		X	X	
	3	X		X	X	X
20BL	1	X		X	X	
	2	X		X	X	
	3	X		X	X	
	4	X		X	X	X
21BL	1	X		X	X	X
	2	X		X	X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

underneath the railroad tracks to the southwest of the lagoons. The last location (OS8) is located to the west of the site across Route 17 in a channel which is believed to be hydraulically connected through storm sewer culverts to Ackerman's Creek.

The surface increment (0-12 inches) at locations OS1 through OS7 was sampled previously. The objective of the current investigation is to find if the contamination found in the surface samples extends to the bottom of the alluvial sediments and into the underlying clay. In order to fulfill this objective, three samples were collected from each boring during the latest investigation: one from the twelve-inch increment just above the soil, one from 0 to 12 inches into the soil and one from 12 to 24 inches into the soil.

The channel where OS8 is located has not been sampled previously and therefore little is known of the stratigraphy. As a means of identifying the material and contamination, four continuous twelve-inch samples were required in the sampling plan. A very hard material encountered at approximately two-feet prevented collection of the third and fourth samples; only the top two samples were collected.

All off-site samples were analyzed for PCBs and TOC. In addition, selected samples were analyzed for VOC + 15, B/N + 15, mercury, chromium, and grain size distribution as shown in Table 3-2.

3.2.3 Berry's Creek Sediments

The rationale for sampling Berry's Creek sediments is to delineate the extent of contamination that was first identified in the on-site channel of the UOP site.

Four borings were located in the Berry's Creek sediments. Two borings were located 250 feet North of the Ackerman's creek northern outlet and two borings were located 250 feet south of the southern outlet as shown on Figure 3-1. The two northern and two southern borings were located along transects bisecting the river

TABLE 3-2

OFF-SITE SOIL/SEDIMENT ANALYSES

UOP SITE, EAST RUTHERFORD, NJ

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
OS1	A	X			X	X
	B	X		X	X	
	C	X		X	X	X
OS2	A	X			X	X
	B	X			X	
	C	X			X	X
OS3	A	X			X	X
	B	X			X	
	C	X			X	X
OS4	A	X			X	X
	B	X			X	
	C	X			X	X

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

TABLE 3-2 (Continued)

Sample Location Number	Sample Depth*	Tier I				
		PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
OS5	A	X			X	
	B	X			X	
	C	X			X	X
OS6	A	X			X	
	B	X			X	
	C	X			X	
OS7	A	X			X	X
	B	X			X	
	C	X			X	X
OS8	1	X	X		X	X
	2	X			X	

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

west to east. Of the two borings at each transect, one was collected along the western shore in the largest accumulation of sediment and the other was collected in the deepest part of the creek channel towards the eastern shore. These borings were located to further delineate the lateral migration of sediment contamination.

The sampling plan called for four 12-inch depth intervals to be collected below the sediment surface as follows: 0 to 12, 12 to 24, 24 to 36, and 36 to 48 inches. All samples were collected except for the 36- to 48-inch increment in the borings located at the greatest sediment accumulation location. At these locations the sampling equipment encountered refusal. All samples collected were analyzed for PCBs, TOC, mercury and chromium. In addition the top and bottom samples were analyzed for VOC+15, B/N+15 and grain size distribution as shown in Table 3-3.

3.2.4 Marsh Sediments

Marsh sediments were sampled to determine if contaminants have been transported out of the stream channels and deposited in the adjacent lowlands during the periodic flooding encountered in the area. Three marsh samples are located along Ackerman's Creek as shown on Figure 3-1. The borings were located at an elevation just below 5 feet in reference to the National Geodetic Vertical Datum (NGVD). A single sample was collected from the 0- to 6-inch depth interval below ground surface. The samples were analyzed for PCBs, TOC and grain size distribution as shown in Table 3-3.

3.2.5 Quality Assurance/Quality Control

Many quality assurance/quality control procedures were implemented during the sampling and analysis to ensure that the goals of the investigation program were fulfilled. Appendix C discusses the procedures implemented during the investigation which include the following topics: Field Documentation, Sampling

TABLE 3-3

BERRY'S CREEK AND MARSH SAMPLE ANALYSES

UOP SITE, EAST RUTHERFORD, NJ

Description	Sample Location Number	Sample Depth*	Tier I				
			PCB	VOC + 15, B/N + 15,	Mercury and Chromium	TOC	Grain Size
Berrys Creek	1BCT**, at deep location	1	X	X	X	X	X
		2	X		X	X	
		3	X	X	X	X	X
		4	X				
	1BCT, at shallow location	1	X	X	X	X	X
		2	X		X	X	
		3	X	X	X	X	
		4	X				
	2BCT, at deep location	1	X	X	X	X	X
		2	X		X	X	
		3	X		X	X	
		4	X	X	X	X	X
	2BCT, at shallow location	1	X	X	X	X	X
		2	X		X	X	
		3	X	X	X	X	X
		4	X				
Marsh Samples	MS1	5	X			X	
	MS2	5	X			X	
	MS3	5	X			X	

*Note: 1 = 0-12 inch sample
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
5 = 0-6 inch sample

A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

Procedures, Equipment Decontamination, Quality Assurance Samples, and Laboratory Quality Assurance/Quality Control.

4. INVESTIGATIVE RESULTS

The investigative results are presented in two sections. In Section 4.1, the results of the most recent investigation, November 1989 through January 1990, are presented. In Section 4.2, the results of all investigations, including the most recent are combined to give an overall picture of stream channel contaminant distribution.

4.1 Results: Samples Collected in 1989-1990

4.1.1 Geology Based on Field Observations

The stream channel soils are generally characterized as a layer of alluvial sediments which overlies various soil strata. The sediment is usually 3 to 4 1/2 feet thick and consists primarily of organic clays or silts. The sediment overlies a 8- to 10-inch layer of either a stiff inorganic or a gravelly sand followed by a 10- to 12-inch layer of gravelly sand. Beneath these layers at approximately 6 to 7 feet is a very stiff varved clay which was encountered uniformly across the entire site. The boring logs for the on-site and off-site stream sediments, marsh sediments and Berry's Creek sediments are presented in Appendix A. The boring logs identify the alluvial sediments as a "peat" material. In order to be consistent with the geotechnical laboratory nomenclature, as presented in Section 4.1.2, the sediments are referred to as organic clays or silts throughout this report.

Observations for borings 4BL, 9BL, and 15BL within Ackerman's Creek show that the sediments are composed of mostly fine sand as opposed to the finer grained silts and clays in other areas. Boring 15BL is located in the straightened portion of Ackerman's Creek which may contain a significant amount of artificial fill materials. These materials may have been introduced during the straightening of the creek or during the installation of the

adjacent railroad spur. Borings 16BL and 18BL, which are located at the mouths of the creek indicate that the alluvial sediments are thicker than in other locations. These sediments may have accumulated due to the reduction of current velocity and consequent sediment deposition as Ackerman's Creek flows into Berry's Creek.

As stated above, field observations show that the first observable layer beneath the sediment is 8 to 10 inches in thickness. This layer is usually composed of a stiff inorganic clay, however in borings 9BL, 13BL, 16BL, 0S2, 0S3, and 0S6, gravelly to silty sands overlie the varved clay. The sampling plan, in some borings required the collection of a 0- to 12-inch and a 12- to 24-inch sample into clay just below the sediments. Those increments below the sediments were sampled, however because different materials were encountered, it was not always clay that was sampled.

In a number of borings (19BL, 21BL, 0S8, Berry's Creek) the soils were too dense to reach the required depth with either the hand-corer or the vibra-corer. Some of the samples obtained with the hand-corer and hand-auger were disturbed. Sediment samples especially were compressed during the driving of the hand-corer as the pore water was forced from the sediments. Therefore, the insitu thickness of the sediments could not be measured directly but was estimated.

4.1.2 Geotechnical Laboratory Results

Moisture content and grain size analyses were performed on approximately half of the samples collected. Based on the results, the sediments generally contain a large percentage of water (greater than 300%, as computed by the following relationship: weight of water divided by weight of solids times 100). Below the sediment, the moisture content of the sand and clay drops below 30%. Field observations indicate that with the exception of boring

3BL and the three marsh samples (MS1 through MS3), the ground surface elevation at all sampling locations are below high tide.

The geotechnical laboratory classified the soil in accordance with the Unified Soil Classification System. A summary of the classification is presented in Appendix B, Table B-1. Sands and gravels were analyzed with mechanical sieves. For clay or if the sample visually contained 25% or more fines, a hydrometer analysis was performed.

The alluvial sediments were classified based on their liquid limit as either a gray clayey silt (ML) with trace peat (PT), or a dark gray organic clayey silt with little fine sand (OL) and trace peat (PT). The cohesionless soils were classified as a gray silty fine sand, with trace medium sand, and trace clay (SM) or as a dark gray fine to medium sand with trace coarse sand and trace silt (SP-SM). The clay was classified as a dark gray brown organic clayey silt with little fine sand (OH) or a gray silty clay with little fine sand (CL).

4.1.3 Chemical Analysis Results

The analytical data show that the sediments contain organic and inorganic contamination. In general, the sediment contamination attentuates with depth. The following sections present the analytical results for each contaminant.

Polychlorinated Biphenyls: PCBs

PCBs were analyzed for all samples collected during the field program. Arcolor 1248 was the only PCB detected. In general, the PCB contamination attentuates with depth and was detected primarily in the sediments. The PCB results are described in more detail in the following paragraphs. All concentrations herein are reported on a dry weight basis unless otherwise specified.

North Ditch

Table 4-1 presents a summary of PCBs in sediments and soil for on-site stream channels. Boring locations 1BL, 2BL, and 3BL are located in the North Ditch as shown on Figure 3-1. PCBs were detected in one of the locations: 2BL. PCBs concentrations in the four samples from 2BL range from 2 mg/kg in the bottom sample which was collected from 6 to 7 feet below ground surface to 72 mg/kg in the 12- to 24-inch sample.

Main On-site Channels

The following discussion of PCB results in the on-site channels is presented by discrete channel sections.

Borings 4BL and 9BL - 12BL are located near the wastewater lagoons. Of these five locations, three: 4BL, 9BL and 12BL, show elevated PCB concentrations in the alluvial sediments, with concentrations ranging from 47 mg/kg to 5,500 mg/kg. PCB concentrations are lower in the soils underlying the sediment in these locations, the maximum being 15 mg/kg. In locations 10L and 11BL, the concentrations are consistently lower than for the other three locations, with a maximum of 9 mg/kg.

Borings 5BL, 6BL and 7BL are in a relatively straight channel approximately southeast of the lagoons. PCB concentrations at these locations reach a maximum of 19 mg/kg but for most of the samples (12 of 16), PCBs are not detected.

Borings 13BL, 14BL and 15BL are located in or near the straightened portion of Ackerman's Creek west of Murray Hill Parkway. The uppermost sample at locations 13BL and 15BL have significantly higher PCB concentrations than any of the other samples at the three locations. Those concentrations are 170 mg/kg at 13BL and 230 mg/kg at 15BL. Concentrations in the other samples are all below 5 mg/kg, with most being non detects.

TABLE 4-1

SUMMARY OF PCBs IN ONSITE STREAM CHANNEL SOILS AND SEDIMENTS

SAMPLES COLLECTED NOVEMBER 1989 - JANUARY 1990

UOP SITE, EAST RUTHERFORD, NJ

Sample Location	Sample** Depth:	PCB Aroclor 1248, mg/kg 1	2	3	4	A	B	C
1BL		-	<0.2	-	-	<0.4	<0.1	<0.01
2BL		-	72	-	-	6.6	2.9	2.0
22BL***		-	-	-	-	-	-	0.1
3BL		-	<0.9	-	-	<0.5	<0.1	<0.2
4BL		-	5,500	-	-	1,100	15	3.5
5BL		19	<0.1	<0.1	<0.1	-	-	-
6BL		9.6	<0.4	0.4	<0.1	-	-	-
7BL		<0.8	13	<0.1	<0.1	-	-	-
33BL***		-	-	<0.1	-	-	-	-
8BL		<15	<0.2	<0.1	<0.1	-	-	-
9BL		-	400	-	-	2,000	5.2	2.4
10BL		-	<0.2	-	-	2	<0.2	<0.2
11BL		-	9.3	-	-	9.3	<0.1	<0.1
12BL		-	47	-	-	140	<0.1	<0.1
12BL-1***		-	410	-	-	-	-	-
13BL		-	170	-	-	4.9	0.1	<0.1
14BL		<0.1	<0.1	<0.1	*	-	-	-
15BL		230	1.0	<0.1	<0.1	-	-	-
16BL		3.7	280	<0.2	<0.5	-	-	-
17BL		16.0	1.1	<0.9	<0.9	-	-	-
18BL		<4.0	<0.2	<0.1	<0.1	-	-	-
70BL***		-	-	<0.1	-	-	-	-
19BL		28	<0.1	<0.1	*	-	-	-
20BL		<0.1	<0.1	<0.1	<0.1	-	-	-
21BL		<0.1	<0.1	*	*	-	-	-

-Not sampled

*Not sampled, depth could not be penetrated by sampling equipment

**Sample depth key: 1 = 0-12 inch sample; 2 = 12-24 inch sample; 3 = 24-36 inch sample; 4 = 36-48 inch sample; A = 12-inch sample above soil; B = 0-12 inch sample in soil; C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above

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Boring 17BL is in a narrow channel running north-south and located just west of Murray Hill Pakway. The PCB concentration in the uppermost sample is 16 mg/kg, while the concentrations in the three lower samples are 1 mg/kg or less.

Borings 8BL, 16BL, 18BL, and 19BL-21BL are located in on-site channels east of Murray Hill Parkway. PCBs were not detected at four of the six locations: 8BL, 18BL, 20BL and 21Bl. The concentration in the uppermost sample of boring 19BL is 28 mg/kg. PCBs are not detected in the two lower samples. The concentration in the 12- to 24-inch sample in boring 16BL is 280 mg/kg. The concentrations of the other three samples at this location are below 4 mg/kg. The 280 mg/kg concentration appears to be anomalously high when compared to other samples in this boring to other locations east of Murray Hill Parkway.

Offsite Channels

PCB concentrations in the off-site sediments are presented in Table 4-2. Borings OS1 through OS7 are located in a channel to the south of the UOP site which is connected to Ackerman's Creek by a culvert underneath the railroad spur.

PCB concentrations in the alluvial sediments range from 24 mg/kg to 380 mg/kg for four of the seven locations while PCBs were not detected at the other three locations. PCBs were not detected in the underlying soils except for concentrations in two samples of 260 mg/kg at OS6 and 4.6 mg/kg at OS7.

Boring OS8 is located in an offsite channel west of Route 17. PCBs were detected in both samples collected at this location. The concentrations are 410 mg/kg in the 0- to 12-inch sample and 110 mg/kg in the 12- to 24-inch sample.

TABLE 4-2

SUMMARY OF PCBs IN OFF-SITE STREAM CHANNELS, BERRY'S CREEK AND MARSH

SAMPLES COLLECTED NOVEMBER 1989 - JANUARY 1990

UOP SITE, EAST RUTHERFORD, NJ

Sample* Location	Sample** Depth:	PCB Aroclor 1248 mg/kg 1	2	3	4	A	B	C
OS1		-	-	-	-	42	<0.2	<0.1
OS2		-	-	-	-	38	<0.3	<0.1
OS3		-	-	-	-	<0.2	<0.1	<0.1
OS11***		-	-	-	-	<0.2	-	-
OS4		-	-	-	-	<0.1	<0.1	<0.1
OS5		-	-	-	-	24	<0.2	<0.1
OS6		-	-	-	-	380	260	<0.1
OS7		-	-	-	-	<0.6	4.6	<0.1
OS8		410	110	*	*	-	-	-
OS9***		26	-	-	-	-	-	-
1BCTD		<0.2	<0.1	<0.1	<0.1	-	-	-
1BCTD-69***		-	-	<0.1	-	-	-	-
1BCTS		<0.1	0.1	<0.3	*	-	-	-
2BCTD		<0.4	<0.1	<0.2	<0.1	-	-	-
2BCTS		<0.1	<0.1	<0.1	*	-	-	-
MS1		6.7						
MS75***		<0.2						
MS2		46						
MS3		20						

-Not Sampled

*Not sampled, depth could not be penetrated by Sampling equipment

**Sample depth key: 1 = 0-12 inch sample, 0-6 inch sample for MS samples
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above

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Berry's Creek

As shown in Table 4-2, PCBs were not detected in Berry's Creek except for one minor detection of 0.14 mg/kg.

Marsh Samples

As shown in Table 4-2, PCBs were detected in all three Marsh Samples. The concentrations are: MS-1, 6.7 mg/kg; MS-2, 46 mg/kg; and MS-3, 20 mg/kg.

Blind Duplicates

As shown on Tables 4-1 and 4-2, several blind duplicate analyses were performed for PCBs. There is good agreement between sample and duplicate when there is little or no PCB in the sample. When elevated PCB concentrations are present there is often a wide discrepancy between the two results. The data validation report (Appendix D) attributes the variance to matrix non-homogenity; therefore, caution should be exercised when interpreting PCB results

As a note, blind duplicate 22BL was erroneously identified in the field notes as a duplicate of 2BL-A rather than 2BL-C. This error was noted after re-examination of the boring logs and geotechnical laboratory results. This change is not reflected in the PCB validation report contained in Appendix D.

Chromium

Table 4-3 presents the results of the chromium analyses. In general, the concentrations attenuate with depth and are primarily concentrated within the alluvial sediments. Chromium was detected in the on-site and off-site borings as well as the Berry's Creek

TABLE 4-3

SUMMARY OF CHROMIUM IN STREAM CHANNEL SEDIMENTS AND SOILS

UOP SITE, EAST RUTHERFORD, NJ

Sample Location	Sample** Depth:	Chromium, mg/kg 1	2	3	4	A	B	C
2BL		-	1,720	-	-	478	14	42
22BL***		-	-	-	-	-	-	20
4BL		-	946	-	-	1,040	36	38
10BL		-	46	-	-	458	59	43
15BL		434	27	17	20	-	-	-
17BL		67	8.2	8.5	13	-	-	-
18BL		2,110	39	24	44	-	-	-
70BL***		-	-	23	-	-	-	-
19BL		2,260	17	22	*	-	-	-
20BL		1,470	13	20	19	-	-	-
21BL		27	29	*	*	-	-	-
OS1		-	-	-	-	-	46	6.7
OS8		998	1,690	*	*	-	-	-
OS9***		140	-	-	-	-	-	-
1BCTD		26	28	27	*	-	-	-
1BCTD-69***		-	-	31	-	-	-	-
1BCTS		149	38	45	*	-	-	-
2BCTD		480	30	20	22	-	-	-
2BCTS		26	24	39	*	-	-	-

-Not sampled

*Not sampled, depth could not be penetrated by sampling equipment

**Sample depth key: 1 = 0-12 inch sample; 2 = 12-24 inch sample; 3 = 24-36 inch sample; 4 = 36-48 inch sample; A = 12-inch sample above soil; B = 0-12 inch sample in soil; C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above

borings. Specific observations regarding the chromium results are discussed in the following paragraphs.

On-Site Channels

Chromium concentrations in the North Ditch and the channels adjacent to the lagoons are much higher in the alluvial sediments than in the underlying soils. Concentrations in the sediments range from 46 mg/kg to 1720 mg/kg while in the soils the range is 14 mg/kg to 59 mg/kg. In the remaining on-site samples, there is a sharp differentiation between the top 12-inch sample and the underlying samples. For these locations the concentrations in the top sample range from 27 mg/kg to 2260 mg/kg while the range for the deeper samples is 8 mg/kg to 44 mg/kg.

Off-Site Channels

One boring location, OS1, in the off-site channel south of Ackerman's Creek was evaluated for chromium. The two samples analyzed are in the soils underlying the sediments. The resulting concentrations are 6.7 mg/kg and 46 mg/kg which are levels that are generally consistent with those found in the on-site channel soils.

The top two samples from boring OS8, located west of Route 17, were analyzed for chromium. The results, 998 mg/kg and 1690 mg/kg are in the high range of all chromium concentrations and consistent with concentrations in the on-site alluvial sediments.

Berry's Creek

The chromium concentrations in Berry's Creek are mostly very low when compared to other areas. Except for two high results, the range is 20 mg/kg to 45 mg/kg. The two results above this range are 149 mg/kg (North of Ackerman's Creek) and 480 mg/kg (south of

Ackerman's Creek). Both of these results are for samples from the top one-foot increment.

Blind Duplicates

As shown on Table 4-3, three blind duplicates were collected for chromium analyses. There was reasonable agreement in all three pairs of results.

Mercury

Table 4-4 presents the results of the mercury analyses. As with chromium, there is a general attenuation of mercury concentrations with depth with the highest concentrations in the alluvial sediments. The mercury results are discussed in more detail in the following paragraphs.

On-Site Channels

In the on-site channels west of Murray Hill Parkway, the highest mercury concentrations are found in the sediments of the North Ditch at boring 2BL. The two sediment results are 10 and 105 mg/kg. Boring 4BL just north of the lagoons has the next highest mercury concentrations: 4.9 and 23 mg/kg. The remaining borings in these channels, 10BL, 15BL and 17L show relatively low concentrations in the sediments with a range of 0.2 to 5.6 mg/kg. The on-site mercury concentrations east of Murray Hill Parkway are significantly higher than to the west but the high concentrations are restricted to the top one-foot sample. The range for these samples is 5 to 125 mg/kg except for 21BL where the top sample concentration is 0.3 mg/kg.

All mercury concentrations for the on-site soils beneath the sediments are less than 5 mg/kg and the majority of concentrations are less than 1 mg/kg.

TABLE 4-4

SUMMARY OF MERCURY IN STREAM CHANNEL SEDIMENTS AND SOILS

UOP SITE, EAST RUTHERFORD, NJ

Mercury, mg/kg

Sample Location	Sample** Depth:	1	2	3	4	A	B	C
2BL		-	105	-	-	10	4.5	0.8
22BL***		-	-	-	-	-	-	0.3
4BL		-	4.9	-	-	23	0.5	0.8
10BL		-	0.8	-	-	5.6	2.8	4.4
15BL		2.3	0.2	0.3	0.1	-	-	-
17BL		0.9	0.3	0.4	0.5	-	-	-
18BL		35	1.1	0.6	0.5	-	-	-
70BL***		-	-	0.3	-	-	-	-
19BL		114	1.5	0.6	*	-	-	-
20BL		125	1.3	0.3	0.3	-	-	-
21BL		0.3	0.2	*	*	-	-	-
OS1		-	-	-	-	-	0.5	0.7
OS8		5.0	<0.16	*	*	-	-	-
OS9***		0.32	-	-	-	-	-	-
1BCTD		4.2	<0.1	4.6	*	-	-	-
1BCTD-69***		-	-	3.4	-	-	-	-
1BCTS		6.1	0.2	5.3	*	-	-	-
2BCTD		30	0.4	0.3	3.9	-	-	-
2BCTS		3.3	0.2	5.1	*	-	-	-

-Not sampled

*Not sampled, depth could not be penetrated by sampling equipment

**Sample depth key: 1 = 0-12 inch sample; 2 = 12-24 inch sample; 3 = 24-36 inch sample; 4 = 36-48 inch sample; A = 12-inch sample above soil; B = 0-12 inch sample in soil; C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above

Off-Site Channels

The off-site channel to the south of the site has very low mercury concentrations in the two samples analyzed from boring OS1: 0.5 and 0.7 mg/kg. Boring OS8 in the off-site channel west of Route 17 has a slightly higher concentration (5 mg/kg) in the uppermost sample.

Berry's Creek

Most mercury concentrations in the Berry's Creek samples are in the 3 to 7 mg/kg range, although there are several concentrations in the non detect to 1 mg/kg range and one at 30 mg/kg. Unlike chromium and mercury in other areas, mercury in Berry's Creek does not display a significant attenuation with depth. Curiously, the top and bottom samples from each boring have higher concentrations than the middle samples.

Blind Duplicates

As shown on Table 4-4 three blind duplicate samples were collected for mercury analyses. There was close agreement in all three pairs of results.

Volatile Organics (VOC+15)

Table E-1 in Appendix E presents the results of the volatile organic analyses of the sediments and soils. Volatile analyses were performed on two samples from the North Ditch, six samples from the on-site channels west of Murray Hill Parkway, one sample from the off-site channel on the west side of Route 17, and eight samples from Berry's Creek.

Two volatile organic analyses were performed for each sample collected for VOC+15. Upon acquisition, a sediment aliquot was

bottled for standard Tier I analysis. Additionally, a part of the sample was preserved in methanol for analysis. The two separate analyses were performed at different dilution factors with resulting different method detection limits (MDLs). The separate analysis resulted in duplicate detections of contaminants at varying concentrations and the detection of compounds which appear at one MDL and not another. Where possible, all the individual detections are presented. However, in some instances (especially for the tentatively identified compounds), only those compounds occurring frequently were reported, the remainder were grouped into the unknown detections.

The data validation and interpretation provided by Trillium Inc. in Appendix D concludes that the only VOC attributable to soil/sediment contamination is chlorobenzene. All other VOCs were introduced into the samples either in the field or in the laboratory. The chlorobenzene results are summarized in Table 4-5. Out of a total of eight on-site samples analyzed for VOCs, chlorobenzene was detected in three samples at concentrations of 0.4 to 25 mg/kg. Chlorobenzene was not detected when analyzed in two off-site samples nor in eight Berry's Creek samples.

Two of the three on-site detections of chlorobenzene are in the soils underlying the sediments in the vicinity of the lagoons. The other detection is in the uppermost sample of boring 15BL near Murray Hill Parkway.

Tentatively Identified Compounds (TICs) were evaluated for each volatile analysis. There were no consistently detected compounds identified in these analyses. Frequently, the highest concentrations were associated with compounds that could not be identified.

Semi-Volatile Organics (B/N + 15)

Semi-volatile organic analyses were performed on the same samples as volatile analyses. In general, the majority of the

TABLE 4-5

CHLOROBENZENE IN SEDIMENTS AND SOIL

UOP SITE, EAST RUTHERFORD, NJ

Sample	Concentration*, mg/kg
4BL-C	0.4
10BL-C	25
15BL-1	22

*Lowest dilution factor result shown. Only samples where chlorobenzene was detected are presented.

detected semi-volatile contamination is comprised of polycyclic aromatic hydrocarbons (PAHs) such as: fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene. In addition, chlorinated benzene compounds and two phthalates: bis(2-ethylhexyl) and di-n-octyl, were also detected. Trillium's QA review concludes that many of the phthalate detections should be rejected because their associated QA blanks contained relatively high concentrations of these two compounds. Table 4-6 summarizes the priority pollutant semi-volatile compounds detected and shows which samples are rejected for phthalates.

In the North Ditch, only di-n-octyl-phthalate is detected in the one sediment sample analyzed, 2BL-2. There are numerous PAHs in the deepest soil sample collected from the same boring. The twelve PAH compounds detected are generally in the 1 to 5 mg/kg range.

Boring 4BL which is near the wastewater lagoons has considerably higher concentrations of PAHs in the sediment. Several PAH compounds were detected at concentrations ranging from 12 to 79 mg/kg. Two isomers of dichlorobenzene and one of trichlorobenzene were detected at concentrations ranging from 16 to 310 mg/kg. Small concentrations of di-n-butyl and di-n-octyl phthalate were detected in the underlying soils at 4BL.

There were no semi-volatile compounds detected at boring 10BL. Two of the phthalates were detected at a maximum concentration of 16 mg/kg in the upper-most sample of 15BL, while no semi-volatiles were detected in the deeper sample.

Numerous semi-volatile compounds were detected in the uppermost sample of boring 0S8 located in the off-site channel west of Route 17. Several PAHs were detected at concentrations ranging from 2.3 to 12.4 mg/kg. Dichlorobenzene was detected at 2.9 mg/kg and bis (2-ethylhexyl) phthalate at 6.87 mg/kg.

TABLE 4-6

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS
SAMPLES COLLECTED NOVEMBER 1989 - JANUARY 1990
UOP SITE EAST RUTHERFORD, NEW JERSEY
(Results reported in milligrams per kilogram)

Compound	2BL-2	2BL-C	22BL	4BL-2	4BL-C	10BL-2	10BL-C
1,4-Dichlorobenzene	<1100	<0.83	<4.1	16 *	<4.2	<0.76	<0.47
1,2-Dichlorobenzene	<1100	<0.83	<4.1	310	<4.2	<0.76	<0.47
1,2,4-Trichlorobenzene	<1100	<0.83	<4.1	43	<4.2	<0.76	<0.47
Napthalene	<1100	0.14 *	<4.1	79	<4.2	<0.76	<0.47
2-Methylnapthalene	<1100	0.07 *	<4.1	6.1	<4.2	<0.76	<0.47
Acenapthene	<1100	0.50 *	<4.1	<58	<4.2	<0.76	<0.47
Dibenzofuran	<1100	0.34 *	<4.1	<58	<4.2	<0.76	<0.47
2,4 Dinitrotoluene	<1100	0.56 *	<4.1	110	<4.2	<0.76	<0.47
Fluorene	<1100	4.6	<4.1	<58	<4.2	<0.76	<0.47
4,6-Dinito-2-methylphenol	<5600	<4.1	<2.1	30 *	<21	<3.8	<3.7
Phenanthrene	<1100	<0.83	<4.1	21 *	<4.2	<0.76	<0.47
Anthracene	<1100	1.2	<4.1	23 *	<4.2	<0.76	<0.47
Di-n-butylphthalate	<1100	<0.83	<4.1	<58	1.4 *	<0.76	<0.47
Fluoranthene	<1100	3.8	<4.1	<58	<4.2	<0.76	<0.47
Pyrene	<1100	2.8	<4.1	13 *	<4.2	<0.76	<0.47
Butylbenzylphthalate	<1100	<0.83	<4.1	<58	<4.2	<0.76	<0.47
Benzo(a)anthracene	<1100	1.4	<4.1	<58	<4.2	<0.76	<0.47
Chrysene	<1100	2.0	<4.1	12 *	<4.2	<0.76	<0.47
bis(2-Ethylhexyl)phthalate	17 R	2.6 R	12 R	77 R	52 R	<0.76	<0.47
Di-n-octyl-phthalate	260 *	<0.83	<4.1	<58	3.0 *	<0.76	<0.47
Benzo(b)fluoranthene	<1100	2.2 *	<4.1	<58	<4.2	<0.76	<0.47
Benzo(a)pyrene	<1100	1.1	<4.1	<58	<4.2	<0.76	<0.47
Ideno(1,2,3-cd)pyrene	<1100	<0.83	<4.1	<58	<4.2	<0.76	<0.47
Dibenzo(a,h)anthacene	<1100	0.22	<4.1	<58	<4.2	<0.76	<0.47
Benzo(g,h,i)perylene	<1100	0.87	<4.1	<58	<4.2	<0.76	<0.47

22BL is a blind duplicate of 2BL-C

* The sample result is an estimate. The reported concentration is below the established analytical detection level.

R = The sample result has been rejected based on EPA CLP/New Jersey Tier I data validation criteria.

TABLE 4-6

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS

SAMPLES COLLECTED NOVEMBER 1989 - JANUARY 1990

UOP SITE EAST RUTHERFORD, NEW JERSEY

(Results reported in milligrams per kilogram)

Compound	15BL-1	15BL-4	1BCTS-1	1BCTS-3	1BCTD-1	1BCTD-3	1BCTD-69
1,4-Dichlorobenzene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
1,2-Dichlorobenzene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
1,2,4-Trichlorobenzene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Napthalene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
2-Methylnapthalene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Acenapthene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Dibenzofuran	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
2,4 Dinitrotoluene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Fluorene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
4,6-Dinito-2-methylphenol	<21	<2.1	<31	<2.2	<2.2	<2.2	<2.2
Phenanthrene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Anthracene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Di-n-butylphthalate	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Fluoranthene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Pyrene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Butylbenzylphthalate	<4.3	<0.42	<6.2	0.28 *	<0.45	<0.44	<0.44
Benzo(a)anthracene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Chrysene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
bis(2-Ethylhexyl)phthalate	16	0.41 R	<6.2	0.54 *	<0.45	<0.44	<0.44
Di-n-octyl-phthalate	1.2 *	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Benzo(b)fluoranthene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Benzo(a)pyrene	<4.3	<0.42	<6.2	0.69	<0.45	<0.44	<0.44
Ideno(1,2,3-cd)pyrene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Dibenzo(a,h)anthacene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44
Benzo(g,h,i)perylene	<4.3	<0.42	<6.2	<0.44	<0.45	<0.44	<0.44

1BCTD-69 is a field duplicate of 1BCTD-3.

* The sample result is an estimate. The reported concentration is below the established analytical detection level.

R = The sample result has been rejected based on EPA CLP/New Jersey Tier I data validation criteria.

TABLE 4-6

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS

SAMPLES COLLECTED NOVEMBER 1989 - JANUARY 1990

UOP SITE EAST RUTHERFORD, NEW JERSEY

(Results reported in milligrams per kilogram)

Compound	2BCTS-1	2BCTS-3	2BCTD-1	2BCTD-4	0S8-1
1,4-Dichlorobenzene	<0.41	<0.44	<0.79	<0.45	<0.01
1,2-Dichlorobenzene	<0.41	<0.44	<0.79	<0.45	2.91 *
1,2,4-Trichlorobenzene	<0.41	<0.44	<0.79	<0.45	<0.01
Napthalene	<0.41	<0.44	<0.79	<0.45	<0.01
2-Methylnapthalene	<0.41	<0.44	<0.79	<0.45	<0.01
Acenapthene	<0.41	<0.44	<0.79	<0.45	<0.01
Dibenzofuran	<0.41	<0.44	<0.79	<0.45	<0.01
2,4 Dinitrotoluene	<0.41	<0.44	<0.79	<0.45	3.61 *
Fluorene	<0.41	<0.44	<0.79	<0.45	2.32 *
4,6-Dinito-2-methylphenol	<2.1	<2.2	<4.0	<2.2	<0.05
Phenanthrene	<0.41	<0.44	0.23 *	<0.45	9.79
Anthracene	<0.41	<0.44	0.19 *	<0.45	3.94 *
Di-n-butylphthalate	<0.41	<0.44	<0.79	<0.45	<0.01
Fluoranthene	<0.41	<0.44	0.74 *	<0.45	12.4
Pyrene	<0.41	<0.44	0.46 *	<0.45	9.02
Butylbenzylphthalate	<0.41	<0.44	<0.79	<0.45	<0.01
Benzo(a)anthracene	<0.41	<0.44	0.26 *	<0.45	4.51
Chrysene	<0.41	<0.44	0.47 *	<0.45	7.45
bis(2-Ethylhexyl)phthalate	0.26 *	0.96	4.8 R	<0.45	6.87 *
Di-n-octyl-phthalate	<0.41	0.09 *	<0.79	<0.45	<0.01
Benzo(b)fluoranthene	<0.41	<0.44	0.50 *	<0.45	8.90
Benzo(a)pyrene	<0.41	<0.44	0.32 *	<0.45	5.64 *
Ideno(1,2,3-cd)pyrene	<0.41	<0.44	<0.79	<0.45	3.38
Dibenzo(a,h)anthacene	<0.41	<0.44	<0.79	<0.45	<0.01
Benzo(g,h,i)perylene	<0.41	<0.44	<0.79	<0.45	<0.01

* The sample result is an estimate. The reported concentration is below the established analytical detection level.

R = The sample result has been rejected based on EPA CLP/New Jersey Tier I data validation criteria.

In Berry's Creek, PAHs were usually not detected. If they were detected, the concentrations were very low, i.e. always less than 1 mg/kg.

Tentatively identified compounds were evaluated for each semi-volatile analysis. There were no consistently identified compounds detected in these analyses, the highest concentrations were associated with compounds that could not be identified.

Total Organic Carbon

Table 4-7 presents the results of Total Organic Carbon (TOC) analyses performed on the sediments and soils. Generally, there is a dramatic difference between TOC concentrations in soils andsediments. The sediment TOC concentrations are characteristically in the tens of thousands to hundreds of thousands of mg/kg. The underlying soils are generally in the hundreds to single digit thousands of mg/kg. These trends are observed in all channels, however, there are exceptions. For instance, the TOC concentrations in boring 10BL are uniformly high from top to bottom even though both sediments and soils were sampled.

4.2 Results: All Samples Collected from 1983 - 1990

This section presents the combined results of the new samples as presented in Section 4.1 and samples collected during four earlier phases from 1983 through 1988. The samples collected and the analyses performed in those earlier phases are summarized in Table 4-8. These samples extended to a maximum depth of thirty inches which is wholly within the sediment stratum and does not extend into the underlying soils. Therefore any changes to the observations of contaminant distribution presented in Section 4.1 are limited to the alluvial sediments. The combined results and any revised observations are presented in the following sections.

TABLE 4-7

TOTAL ORGANIC CARBON IN SOILS/SEDIMENTS (mg/kg)

UOP SITE, EAST RUTHERFORD, NJ

Sample Location	Sample** Depth:	1	2	3	4	A	B	C
1BL		-	150,000	-	-	108,000	11,000	450
2BL		-	410,000	-	-	340,000	3,100	4,200
22BL***		-	-	-	-	-	-	2,700
3BL		-	82,000	-	-	216,000	3,600	88,000
4BL		-	1,600	-	-	84,000	4,600	-
5BL		120,000	7,800	7,000	4,000	-	-	-
6BL		130,000	7,900	3,600	4,000	-	-	-
7BL		170,000	20,000	44,000	13,000	-	-	-
33BL***		-	-	19,000	-	-	-	-
8BL		67,000	89,000	6,000	2,300	-	-	-
9BL		-	16,000	-	-	58,000	85,000	4,500
10BL		-	62,000	-	-	53,000	75,000	65,000
11BL		-	53,000	-	-	82,000	23,000	8,600
12BL		-	40,000	-	-	186,000	2,000	2,600
12BL-1***		-	147,000	-	-	-	-	-
13BL		-	63,000	-	-	-	-	4,500
14BL		33,000	1,700	2,500	*	-	-	-
15BL		1,500	1,200	900	860	-	-	-
16BL		88,000	57,000	76,000	88,000	-	-	-
17BL		47,000	5,200	3,400	1,600	-	-	-
18BL		76,000	58,000	70,000	15,000	-	-	-
70BL***		-	-	27,000	-	-	-	-
19BL		200,000	16,000	5,500	*	-	-	-
20BL		24,000	130,000	14,000	2,000	-	-	-
21BL		7,100	2,800	*	*	-	-	-

-Not sampled

*Not sampled, depth could not be penetrated by sampling equipment

**Sample depth key: 1 = 0-12 inch sample; 2 = 12-24 inch sample; 3 = 24-36 inch sample; 4 = 36-48 inch sample; 5 = 0-6 inch sample; A = 12-inch sample above soil; B = 0-12 inch sample in soil; C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above.

TABLE 4-7 (Continued)

Sample Location	Sample** Depth:	1	2	3	4	A	B	C
OS1		-	-	-	-	97,000	50,000	10,000
OS2		-	-	-	-	84,000	84,000	6,000
OS3		-	-	-	-	37,000	37,000	11,000
OS-11***		-	-	-	-	60,000	-	-
OS4		-	-	-	-	9,300	5,700	3,300
OS5		-	-	-	-	52,000	25,000	14,000
OS6		-	-	-	-	108,000	19,000	8,600
OS7		-	-	-	-	140,000	41,000	8,600
OS8		100,000	39,000	*	*	-	-	-
OS9***		75,000	-	-	-	-	-	-
1BCTS		64,000	56,000	110,000	*	-	-	-
1BCTD		1,700	2,600	2,200	*	-	-	-
1BCTD-69***		-	-	1,700	-	-	-	-
2BCTS		2,400	3,900	3,400	*	-	-	-
2BCTD		25,000	6,600	1,600	17,000	-	-	-
MS		160,000	270,000	100,000	-	-	-	-
MS75***		140,000	-	-	-	-	-	-

-Not sampled
*Not sampled, depth could not be penetrated by sampling equipment
**Sample depth key: 1 = 0-12 inch sample
0-6 inch sample for MS samples
2 = 12-24 inch sample
3 = 24-36 inch sample
4 = 36-48 inch sample
A = 12-inch sample above soil
B = 0-12 inch sample in soil
C = 12-24 inch sample in soil

***Sample is a blind duplicate of the sample immediately above.

TABLE 4-8

SUMMARY OF SAMPLES COLLECTED AND ANALYSES PERFORMED DURING INVESTIGATIONS FROM 1983 THROUGH 1988, UOP SITE, E. RUTHERFORD, NJ

Constituents Analyzed

Investigation Phase	Sample Number(s)	Volatile Organic Compounds	Base/Neutral Extractable Compounds	Acid Extractable Compounds	PCBs	1. Arsenic 2. Chromium 3. Cyanide 4. Lead 5. Manganese	6. Zinc 7. Cadmium 8. Phenols 9. Mercury
I	SS1-SS5		X			1-8	
II	SS2 and SS6-SS11		X	X	X	1-9	
III - Pilot Study	2BT	X			X	2,9	
	4BT,5B, 6BT,15BT				X	2,9	
III - Off-site Samples	OS1	X	X		X	2,9	
	OS2-OS7				X	2,9	
Ecological Risk Assessment	Aa,Ab,Ac, Bc,Bb,Bc, Ca,Cb,Cc				X	2,9	

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Several surface water samples were also analyzed as part of the early investigations. The results of those analyses are documented in the Phase II Investigation Report.

4.2.1 PCBs

Table 4-9 presents the results of PCB analyses for samples collected before 1989. These results are combined with the new data on Figure 4-1 (in the back pocket) to show the results of all PCB analyses in the stream channel sediments and underlying soils. The combined results of all PCB data reinforce the observations presented in Section 4.1.3, with the following exceptions:

1. The combined results show a more detailed delineation of PCBs in the straight channel between locations Ab and 7BL. In the section of this channel west of boring 5BL, PCB concentrations mostly exceed 100 mg/kg while concentrations in the eastern section are all below 20 mg/kg.
2. PCB concentrations at locations 14BL and 15BT are relatively low. These results provide some indication that the straight channel between 13BL and 15BL have deposits of higher concentrations at each end and the middle section has relatively low concentrations.
3. The uppermost sediment samples in the off-site channel (OS1 - OS7) were collected in 1987 and generally have higher concentrations than deeper sediment samples. The uppermost sample concentrations are generally in the 100 to 400 mg/kg range while deeper sediment samples are generally in the ND to 40 mg/kg range.

TABLE 4-9
PCB CONCENTRATIONS IN SEDIMENT
SAMPLES COLLECTED 1983-1988
UOP SITE, EAST RUTHERFORD, NJ

Investigation Phase	Sample Location	PCB Concentration, mg/kg
II	SS2	230
	SS6	ND
	SS7	ND
	SS8	160
	SS9	300
	SS10	13
	SS11	ND
III - On-site	2BT RB 0-15"	22
	2BT RB 15-30"	66
	2BT LB 0-15"	28
	2BT LB 15-30"	0.86
	4BT RB 0-15"	76
	4BT RB 15-30"	245
	4BT CTR 0-15"	181
	4BTCTR 15-30"	212
	4BT LB 15-30"	189
	5B 0-15"	365
	6BT RB 0-15"	102
	6BT CTR 0-15"	142
	6BT RB 15-30"	131
	6BT LB 0-15"	568
	6BT LB 15-30"	226
	15BT RB 0-15"	ND
	15BT RB 15-30"	ND
	15BT CTR 0-15"	16
	15BT LB 0-15"	5
	15BT LB 15-30"	10

TABLE 4-9 (Continued)

Investigation Phase	Sample Location	PCB Concentration, mg/kg
III - Off-site	OS1	120
	OS2	420
	OS3	110
	OS4	ND
	OS5	270
	OS6	140
	OS7	250
Ecological Risk Assessment	Aa	66
	Ab	82
	Ac	123
	Ba	100
	Bb	41
	Bc	7.7
	Ca	5.3
	Cb	14
	Cc	23

4.2.2 Chromium

Table 4-10 shows the chromium results for samples collected prior to 1989. Figure 4-2 (in back pocket) shows the results of all chromium analyses. The combined results are consistent with the new data results presented in Section 4.1.3, with the following exceptions:

1. Chromium concentrations in the vicinity of the lagoons are approximately an order of magnitude higher in the older data than in the new data. Consequently, concentrations for the whole data set range from 47 mg/kg to 47,800 mg/kg.
2. The earlier phase data provide the only two sediment concentration values in the off-site channel. One is relatively high at 17,100 mg/kg and the other relatively low at 7.8 mg/kg. The lower value is located in a channel section of high water velocities and thus little sediment is deposited there.

4.2.3 Mercury

Table 4-11 shows the mercury results for samples collected prior to 1989. Figure 4-3 (in back pocket) shows the results of all mercury analyses. The combined results are consistent with the new data results presented in Section 4.1.3, with the following exceptions:

1. The new data show that mercury concentrations are much lower on the west side than on the east side of Murray Hill Parkway. The combined data eliminate this observation because concentrations in the channels to the east and north of the lagoons have mercury of equal magnitude. The concentrations in these channels range

TABLE 4-10
CHROMIUM CONCENTRATIONS IN SEDIMENT
SAMPLES COLLECTED 1983-1988
UOP SITE, EAST RUTHERFORD, NJ

Investigation Phase	Sample Location	Cr Concentration, mg/kg
I	SS1	660
	SS2	4,000
	SS3	160
	SS4	130
	SS5	7.8
II	SS2	4,100
	SS6	140
	SS7	480
	SS8	5,200
	SS9	220
	SS10	220
	SS11	100
III	2BT RB 0-15"	1,430
	2BT RB 15-30"	631
	2BT LB 0-15"	1,730
	2BT LB 15-30"	250
	4BT RB 0-15"	2,670
	4BT RB 15-30"	1,290
	4BT CTR 0-15"	3,970
	4BT CTR 15-30"	1,940
	4BT LB 15-30"	15,700
	5B 0-15"	11,200
	6BT RB 0-15"	24,500
	6BT CTR 0-15"	24,000
	6BT CTR 15-30"	47,800
	6BT LB 0-15"	23,600

TABLE 4-10 (Continued)

Investigation Phase	Sample Location	Cr Concentration, mg/kg
	6BT LB 15-30"	17,600
	15BT RB 0-15"	212
	15BT RB 15-30"	48
	15BT CTR 0-15"	34
	15BT LB 0-15"	344
	15BT LB 15-30"	453
	OS1	17,100
Ecological Risk Assessment	Aa	4,240
	Ab	5,600
	Ac	26,900
	Ba	9,010
	Bb	4,110
	Bc	7,400
	Ca	1,120
	Cb	1,840
	Cc	6.57

TABLE 4-11
MERCURY CONCENTRATIONS IN SEDIMENT
SAMPLES COLLECTED 1983-1988
UOP SITE, EAST RUTHERFORD, NJ

Investigation Phase	Sample Location	Hg Concentration, mg/kg
I	SS5	40
II	SS2	40
	SS6	5.2
	SS7	20
	SS8	6.7
	SS9	23
	SS10	8.6
	SS11	8.1
III	2BT RB 0-15"	23
	2BT RR 15-30"	19
	2BT LB 0-15"	26
	2BT LB 15-30"	2.1
	4BT RB 0-15"	4.5
	4BT RB 15-30"	4.4
	4BT CTR 0-15"	23
	4BT CTR 15-30"	12
	4BT LB 15-30"	28
	5B 0-15"	140
	6BT RB 0-15"	220
	6BT CTR 0-15"	170
	6BT CTR 15-30"	210
	6BT LB 0-15"	91
	6BT LB 15-30"	93
	15BT RB 0-15"	4.5
	15BT RB 15-30"	0.45

TABLE 4-11 (Continued)

Investigation Phase	Sample Location	Hg Concentration, mg/kg
	15BT CTR 0-15"	0.89
	15BT LB 0-15"	4.3
	15BT LB 15-30"	7.7
	OS1	164
Ecological	Aa	58
Risk	Ab	24
Assessment	Ac	108
	Ba	33
	Bb	22
	Bc	86
	Ca	5.9
	Cb	19
	Cc	7.75

from less than one to 220 mg/kg. The straight channel between 13BL and 15BL has uniformly lower concentrations; all are below 20 mg/kg.

2. The earlier phase data provide the only two mercury concentrations in the off-site sediments. The concentrations are relatively high at 40 and 164 mg/kg.

4.2.4 VOCs

Table 4-12 shows the VOC results for samples collected prior to 1989. These early samples were collected from the North Ditch and from the offsite channel. The results show significant concentrations of benzene, toluene, xylenes, chlorotoluene, and dichlorobenzenes in the North Ditch. VOC concentrations in the off-site channel are very low: the sum of all the concentrations is 0.483 mg/kg.

4.2.5 Base/Neutrals

Table 4-13 shows the base neutral (semi-volatile) compound results for samples collected prior to 1989. These samples were collected from the North Ditch, the main on-site channels, and the off-site channel. These early phase data provide the following observations in addition to those made from the new data in Section 4.1.3:

1. 1,2-dichlorobenzene was detected at the relatively high concentration of 1,600 mg/kg in the sediment of the North Ditch and at the relatively low concentration of 11 mg/kg at SS4 which is near new boring location 15BL. The new rsults do not show this compound to be present in these two areas.

TABLE 4-12

CONCENTRATION OF VOCs FROM PHASE I, II & III SEDIMENT SAMPLES

UOP SITE, EAST RUTHERFORD, NJ

	Sample/Concentration, mg/kg				
Constituent	2BT RB* 0-15"	2BT RB 15-30"	2BT LB 0-15"	2BT LB 15-30"	OS1
benzene	2.1	38	8.2	2.2	0.046
2-butanone	ND	ND	ND	ND	0.12
toluene	4.5	110	38	5.9	0.009
carbon disulfide	ND	ND	ND	ND	0.019
chlorobenzene	ND	ND	6.9	3.8	0.20
ethylbenzene	0.64	13	ND	ND	0.03
p-xylene	ND	9.8	ND	ND	-
m-xylene	1.9	41	ND	ND	-
o-xylene	0.41	15	ND	ND	-
total xylenes	-	-	-	-	0.059
o-chlorotoluene	3.3	100	7.3	0.83	ND
p-dichlorobenzene	ND	3.4	1.4	0.35	ND
o-dichlorobenzene	3.5	120	60	20	ND

*RB = Right Bank, looking upstream
LB = Left Bank, looking upstream
(-) = Not Analyzed

TABLE 4-13
CONCENTRATION OF SEMI-VOLATILE COMPOUNDS FROM PHASE I, II AND III SEDIMENT SAMPLES UOP SITE, EAST RUTHERFORD, NJ

	Sample/Concentration, mg/kg												
	B/Ns, Phase I					B/Ns, Phase II							
Constituent	SS1	SS2	SS3	SS4	SS5	SS2	SS6	SS7	SS8	SS9	SS10	SS11	OS1
1,2,4-trichlorobenzene	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	ND	ND	ND
1,2-dichlorobenzene	38	0.9	1.5	11	0.15	0.23	1,600	1.6	0.13	ND	ND	ND	1.9
1,3-dichlorobenzene	14	ND	ND	ND	ND	ND	ND	ND	0.59	ND	ND	ND	ND
1,4-dichlorobenzene	29	ND	ND	ND	ND	ND	ND	ND	0.75	2.4	ND	ND	ND
1,2-diphenylhydrazine	ND	ND	ND	ND	ND	2.2	ND	ND	7.8	6.5	ND	ND	ND
fluoranthene	ND	1.0	0.5	ND	0.16	0.18	ND	2.4	ND	ND	0.16	0.22	6.2
bis(2-ethylhexyl)phthalate	ND	10	16	ND	1.8	9.5	ND	ND	ND	Nd	ND	ND	98
benzo(a)anthracene	ND	0.6	ND	ND	0.1	0.11	ND	ND	0.16	4.0	0.10	ND	ND
benzo(a)pyrene	ND	0.5	0.5	ND	0.11	0.091	ND	ND	0.12	5.3	0.12	ND	2.7
3,4-benzofluoranthene	ND	0.7	0.5	ND	0.22	0.082	ND	ND	0.21	6.0	0.20	ND	5.6
benzo(a)fluoranthene	ND	0.7	0.5	ND	0.22	0.082	ND	ND	0.21	6.0	0.20	ND	ND
chrysene	ND	0.6	0.6	ND	0.12	0.15	ND	ND	0.11	2.8	0.10	ND	4.5
acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND
anthracene	ND	0.6	ND	ND	ND	ND	ND	ND	0.17	0.1	ND	ND	2.7
flourene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND
phenanthrene	ND	0.6	Nd	ND	0.1	ND	ND	1.3	ND	5.8	ND	ND	ND
pyrene	ND	1.1	0.6	ND	0.18	0.13	ND	2.2	ND	ND	0.12	ND	7.7
n-nitrosodiphenylamine	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.8
di-n-butylphthalate	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND	ND
benzo(ghi)perylene	ND	ND	ND	ND	0.06	ND	ND	ND	ND	ND	ND	ND	2.1
ideno(1,2,3-cd)pyrene	ND	ND	ND	ND	0.06	ND	ND	ND	ND	ND	ND	ND	ND

2. Very low PAH concentrations (each compound at less than 1 mg/kg) are in the sediments east of Murray Hill Parkway.

4.2.6 Other Inorganics

In addition to chromium and mercury, six other inorganic compounds: arsenic, cyanide, lead, manganese, zinc and cadmium, were analyzed as part of the Phase I and II Investigations. The results for these constituents are shown in Table 4-14. These compounds were either detected at low concentrations or concentrations considered to be within background limits for the area. Therefore, no further sampling for these constituents was performed after the Phase II Investigation.

4.2.7 Acid Extractable Organic Compounds

Acid extractable organic compound analyses were performed on several Phase I and II Investigation samples. Phenol was the only compound detected from this suite; the results of which are shown in Table 4-15. Only two sample locations: SS1 and SS8, had phenol concentrations of any significance. Both of these samples are in the vicinity of the lagoons where compounds of greater concern and at higher concentrations were identified. Because of the presence of these other compounds, analyses for phenol were not performed after the Phase II Investigation.

TABLE 4-14

CONCENTRATION OF INORGANICS FROM PHASE I AND II SEDIMENT SAMPLES

UOP SITE, EAST RUTHERFORD, NJ

Sample/Concentration,mg/kg

	Inorganics, Phase I					Inorganics, Phase II						
Constituent	SS1	SS2	SS3	SS4	SS5	SS2	SS6	SS7	SS8	SS9	SS10	SS11
arsenic	12	20	1.9	4.4	1.8	50	3.8	19	29	4.0	12	1.9
cyanide	5.9	11	ND	ND	ND	2.5	ND	ND	Nd	0.5	ND	
lead	88	80	25	25	3.8	90	50	130	75	90	50	56
manganese	3,200	1,600	360	110	10	1,800	63	3,800	13,000	1,200	3,000	74
zinc	300	580	145	53	20	430	29	250	210	120	300	230
cadmium	0.64	2.4	1.3	0.2	0.09	2.7	1.0	2.1	1.2	1.0	1.6	4.3

TABLE 4-15
CONCENTRATION OF PHENOL
FROM PHASE I AND II SEDIMENT SAMPLES
UOP SITE, EAST RUTHERFORD, NJ

Sample	Phenol Concentration, mg/kg
SS1	17.0
SS2	1.6
SS3	0.8
SS4	0.9
SS5	0.1
SS8	100

5. SUMMARY AND CONCLUSIONS

The Remedial Investigation Report for the tidal stream channels is based on data collected during several phases of investigation beginning in 1983 and ending in January 1990. During the early phases of investigation (1983-1988), sediment samples were collected. For the most-recent investigation (November 1989 - January 1990), sediments, soils beneath the sediments and soils in marshlands adjacent to the stream channels were collected. The resulting body of data from all investigations includes:

- geologic field observations,
- contaminant data: PCBs, priority pollutant metals, VOCs and semi-volatile compounds,
- total organic carbon, and
- grain size distribution.

The following paragraphs summarize the data obtained from the field investigations.

The soil strata in the stream channels consist generally of a 3.5- to 4-foot layer of alluvial sediments overlying clay or gravelly sand. In the deepest portion of Berry's Creek, the sediment layer has eroded away, leaving only the clay. The sediments are highly organic which is expected in a tidal estuarine system. The underlying soils have significantly lower organic carbon content.

Contamination in the stream channels, with very few exceptions, is restricted to the alluvial sediments. The few significant detections of contaminants in the underlying soils are summarized as follows:

1. 15 mg/kg of PCBs at 4BL, near the wastewater lagoons,
2. 25 mg/kg of chlorobenzene at 10BL, near the wastewater lagoons,

3. 260 mg/kg of PCBs at OS7, in the off-site channel,
4. numerous PAH compounds ranging from 1 to 5 mg/kg at 2BL, in the North Ditch.

These results raise potential concerns for the soils in the three areas identified: the North Ditch, the channels near the lagoons and the off-site channel to the south of the site.

Review of the stream channel sediment data highlights some trends of contaminant distribution. The overall conclusion is that PCBs, chromium and mercury are the most pervasive contaminants in the channel sediments. These contaminants are distributed uniquely within the channel system. For instance the distribution in the North Ditch is different than the distribution in the off-site channel. Table 5-1 presents some summary statistics for specific channel sections in which the results for PCBs, Hg and Cr are somewhat consistent.

The on-site channel sections in Table 5-1 are identified by number. The highest PCB, Hg and Cr concentrations are found in on-site channel numbers 1, 2, and 5. Channels 1 and 2 form the perimeter of the wastewater lagoons. Channel 5 is located to the west of the lagoons on the west side of the railroad tracks.

Channel 6, which is the straightened portion of Ackerman's Creek west of Murray Hill Parkway and Channel 7, which is the system of channels east of Murray Hill Parkway contain a few isolated high detections of PCB, Hg and Cr. Most of these detections are in the uppermost sediment sample at each boring. One exception is a PCB concentration of 280 mg/kg in the 12- to 24-inch sample at boring 16BL. All other concentrations from this boring are very low. Two explanations for this lone high concentration are: 1. a sample labelling error could have been made in the field or laboratory, and 2. sediment transport processes could have deposited contaminated material and then covered it up with cleaner material.

TABLE 5-1

SUMMARY STATISTICS FOR PCB, CR, HG IN SEDIMENTS BY STREAM CHANNEL SECTION

UOP SITE, EAST RUTHERFORD, NJ

Channel Section	Sample Locations	Statistics, mg/kg PCB (mg/kg) Range	PCB (mg/kg) Average	Chromium (mg/kg) Range	Chromium (mg/kg) Average	Mercury (mg/kg) Range	Mercury (mg/kg) Average
North Ditch	SS6, 2BT, 1BL, 2BL, 3BL	0-72	18	140-1730	911	2.1-105	27
On Site:							
1-North of Lagoons	SS1, SS2, SS7, 4BT, 5B, 6BT, Aa, Ab, Ac, 4BL	0-5500	530	480-47,800	11,480	4.4-220	71
2-East and South of Lagoons	SS8, Ba, Bb, Bc, 9BL-13BL	0-2,000	221	46-9010	4371	0.8-86	26
3-East-West Channel	5BL-7BL	0-19	3.5	-	-	-	-
4-North-South Channel	17BL	0-16	4	8-67	24	0.3-0.9	0.5
5-West of RR Tracks	SS9	-	300	-	220	-	23
6-Straightened Ackerman's Creek	SS3, SS4, 15BT, Ca, Cb, Cc, 14BL, 15BL	0-230	20	7-1840	346	0.1-19	3.8
7-East of Murray Hill Pkwy.	SS10, SS11, 8BL, 16BL, 18-21BL	0-280	15	13-2260	428	0.2-125	19
Offsite:							
-South of UOP site	SS5, OS1-OS7	0-420	128	8-17,100	8554	40-164	102
-West of Route 17	OS8	110-410	260	998-1690	1344	0-5	2.5
Berry's Creek	1BCT-2BCT	0-0.1	0	20-480	73	0-30	4.9

Mercury and chromium appear to be ubiquitous throughout much of the on-site stream channels; however, they are notably low in the straightened portion of Ackerman's Creek. These lower concentrations of Hg & Cr may be in part due to the lower organic carbon content in this channel section; the contaminants will tend to adsorb less onto low organic soils. The lower organic content in this channel section is believed to be the result of filling with low-organic granular material when the straight channel and the adjacent railroad siding were constructed.

The off-site channel to the south of the site has elevated concentrations of PCBs, Cr and Hg. The off-site channel to the west of Route 17 has elevated concentrations of PCBs and Cr, but relatively low Hg concentrations.

Berry's Creek is less contaminated than any other channel. PCBs were not detected except at a very low concentration (0.1 mg/kg) in one sample. Chromium was detected at low concentrations, usually in the 0 to 100 mg/kg range. Mercury concentrations are usually in the 3 to 6 mg/kg range except for one concentration of 30 mg/kg and three that are less than 1 mg/kg. Mercury concentrations in Berry's Creek were expected to be higher because of the perception that the source of mercury contamination is a site upstream on Berry's Creek. Sampling in stream channels east of Berry's Creek for the Ecological Risk Assessment provides a possible explanation for the results. The samples from those channels have very high mercury concentrations which shows that elevated mercury concentrations are present in the side channels on both sides of Berry's Creek. If the mercury was first introduced into Berry's Creek, it may have migrated downstream and into the side channels such as Ackerman's Creek. Since that time, the stronger currents in Berry's Creek may have helped transport the mercury away from that area while it remains in the quieter side channels on both sides of Berry's Creek.

The three marsh samples were analyzed for one constituent, PCBs, which were detected in all three samples. The PCB

Why only PCB?

concentrations in the Marsh Samples were lower than in many of the sediment samples, but were not insignificant. The three marsh samples represent very large areas. With so few samples, the result is a very poor contaminant characterization of the marsh areas. Additional investigation of these areas is recommended before the feasibility study for Area 4 is initiated.

In addition to PCB, Hg and Cr contamination there are elevated concentrations of chlorinated benzenes and PAHs in some areas. Their concentrations are not nearly as high as PCB, Hg and Cr and they are detected primarily in the North Ditch, adjacent to the lagoons and in the off-site channel, all of which are areas of elevated PCB, Hg and Cr concentrations.

Table 5-2 presents an overall summary of the areas of concern based on the constituents detected and their concentrations. This table shows that the major contamination concerns are located in the channels near the wastewater lagoons, in the North Ditch and in the off-site channels to the west and south of the site. Potential concerns of less intensity are present in isolated pockets in the remaining on-site channels. Mercury and chromium are present at relatively low concentrations in Berry's Creek.

Other Considerations

Chromium in the environment generally takes two forms: trivalent, which is usually the most abundant, and hexavalent, which is by far the most toxic of the two forms. Hexavalent chromium analyses performed during the Ecological Risk Assessment confirmed that the more toxic hexavalent form was a very small percentage (less than 1) of the total chromium.

Part of the design of the RI was to determine if contaminants tended to deposit in the coves along the stream channels. The locations for Borings 5BL, 10BL and 13BL were selected for this purpose. The PCB results for those locations are no higher than

TABLE 5-2

SUMMARY OF CONSTITUENTS OF CONCERN AND

LOCATION OF IMPACTED STREAM CHANNELS

Constituent	Impacted Stream Channels
Greatest Concern:	
PCB, Hg, Cr	1. Channels forming perimeter of the wastewater lagoons 2. Off-site channels south and west of site
Chlorinated Benzenes and PAHs	Near the lagoons and in the North Ditch
Less Concern:	
PCB, Hg, Cr	1. Isolated locations in on-site channels east of Murray Hill Parkway 2. One location (15BL) just west of Murray Hill Parkway
VOC	North Ditch
Hg, Cr	Berrys Creek

nearby locations and in fact show a tendency to be lower. Other constituents were not analyzed often enough to make any observations.

Another objective of the RI was to determine if Berry's Creek would have higher contaminant concentrations in areas of thicker sediment accumulation. Therefore each Berry's Creek transect consisted of one sample collected in deep water with less sediment and one in shallow water with a greater sediment accumulation. The results show no discernable pattern between the deep and shallow sample locations.

Table 5-2 presents a picture of the contamination as it exists now. As with any contamination, it is important to consider the rate at which contaminants may be moving and potentially worsening the present situation. The primary contaminants of concern: PCBs, Hg and Cr have a high affinity to adsorb to organic carbon which is present at high levels in the sediments. Therefore, it is expected that these contaminants will, for the most part, remain adsorbed to the sediments. The biggest concern then, is the potential for contaminants to move with sediments that are being transported by river flows. It appears that the sediment is not moving in any dramatic way. This conclusion is based on the observation, through field visits and inspection of aerial photographs, that the depth and alignment of the channels are not changing. Therefore, a rapid contaminant transport rate is not anticipated. However, on a long-term basis the contamination in the channels will spread. The high concentration of contaminants in the vicinity of the lagoons will tend to dissipate upstream and downstream but primarily in the downstream direction toward Berry's Creek because the net flow is in that direction. There is also the possibility that sediments will be transported into the adjacent wetlands during flooding events. It is not known how the contaminants were first introduced into the stream channels, therefore, it is not possible to explain the presence of contamination over the long distance between Berry's Creek and the off-site channel west of Route 17. It is

likely that sediment transport over the span of many years has contributed to this spread of contamination. Similarly, it is likely that the spreading process continues at the present time although at an unknown rate.

APPENDIX E
VOLATILE ORGANIC COMPOUND ANALYSIS RESULTS

Stream Channel Sampling Program
UOP Site, East Rutherford, NJ

TABLE E-1

SUMMARY OF ALL VOLATILE ORGANIC COMPOUNDS

SAMPLES COLLECTED NOVEMBER 1989-JANUARY 1990

UOP SITE, EAST RUTHERFORD, NEW JERSEY

Results Reported in Milligrams Per Kilograms (mg/kg)
Equivalent To Parts Per Million (ppm)

Compound[1]	2BL-2 (DF=390,60)	2BL-2* (DF=2274,80)	2BL-C (DF=89,62)	2BL-C* (DF=259,76)	22BL (DF=124,60)	22BL* (DF=269,60)
Methylene Chloride	<0.62	5 R	<0.45	<1.3	<0.62	0.96 R
Acetone	<0.12	96 R	<0.90	<2.6	2.1 R	9.6 R
2-Butanone	0.78 R	340 R	0.12 R	22 R	15 R	46 R
1,1,1 Trichloroethane	<0.62	8.8 R	<0.45	<1.3	<0.62	<1.4
Vinyl Acetate	<0.12	17 R	<0.90	1.3 JR	<1.2	3.6 R
1,1,2,2 Tetrachloroethane	<0.62	310 R	<0.45	3.3 R	<0.62	1.3 R
Toluene	<0.62	5.2 R	<0.45	<1.3	<0.62	0.56R
Chlorobenzene	<0.62	8.8 R	<0.45	<1.3	<0.62	<1.4
Ethylbenzene	<0.62	11 R	<0.45	<1.3	<0.62	<1.4
Trichloroethene	<0.62	<11	<0.45	<1.3	<0.62	<1.4
1,2-Dichloroethene (Total)	<0.62	<0.145	<0.45	<1.3	<0.62	<1.4

DF = Dilution Factor
1 = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
J = The result is an estimate. The reported result is below the established analytical detection limit
22BL = Is a field duplicate of 2BL-C
* = The sample was preserved with methanol to prevent the loss of volatile organic compunds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	4BL-2* (DF=176.88)	4BL-2 (DF=205.00)	4BL-C* (DF=136.88)	4BL-C (DF=152.25)	4BL-C (DF=1247.98)	4BL-C* (DF=1368.57)
Methylene Chloride	<0.88	<0.63	<0.72	<0.76	<6.2	<6.8
Acetone	<1.8	3.1 R	<1.4	6.6 R	67 ER	<14
2-Butanone	32 R	14 R	<1.4	<1.5	160 R	<14
1,1,1 Trichloroethane	<0.88	<0.63	<0.72	<0.76	<6.2	<6.8
Vinyl Acetate	<1.8	<1.2	<1.4	<1.5	<12	<14
1,1,2,2 Tetrachloroethane	15 R	0.38 R	6.2 R	0.97 R	12 R	2.1 R
Toluene	1.9 R	<0.63	0.56 R	<0.76	<6.2	<6.8
Chlorobenzene	1.5 R	<0.63	0.40 R	<0.76	<6.2	<6.8
Ethylbenzene	0.8 JR	<0.63	<0.72	<0.76	<6.2	<6.8
Trichloroethene	3.7 R	<0.63	9.6 R	0.43 JR	65 R	89 R
1,2-Dichloroethene (Total)	<0.88	<0.63	<0.72	<0.76	<6.2	19 R

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
J = The result is an estimate. The reported result is below the established analytical detection limit
E = The result is an estimate. The reported result exceeded the calibration range of the analytical instrument.
* = The sample was preserved with methanol to prevent the loss of volatile organic compunds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	10BL-2 (DF=271.15)	10BL-2* (DF=461.53)	10BL-C (DF=263.71)	10BL-C* (DF=534.10)
Methylene Chloride	<1.4	<2.3	<1.3	<2.7
Acetone	<2.7	<4.6	<2.6	<5.3
2-Butanone	19 R	39 RD	16 R	37 R
1,1,1 Trichloroethane	<1.4	<2.3	<1.3	<2.7
Vinyl Acetate	<2.7	<4.6	<2.6	<5.3
1,1,2,2 Tetrachloroethane	<1.4	<2.3	<1.3	<2.7
Toluene	<1.4	<2.3	<1.3	0.82 JR
Chlorobenzene	<1.4	<2.3	<1.3	2.5 JR
Ethylbenzene	<1.4	<2.3	<1.3	<2.7
Trichloroethene	<1.4	<2.3	0.20 R	<0.82 JR
1,2-Dichloroethene (Total)	<1.4	<2.3	<1.3	<2.7

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
J = The result is an estimate. The reported result is below the established analytical detection limit
D = The result is the mean of duplicate analyses.
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	15BL-1 (DF=152.44)	15BL-1* (DF=399.84)	15BL-1 (DF=500.00)	15BL-1 (DF=762.20)	15BL-4 (DF=150.60)	15BL-4* (DF=189.74)
Methylene Chloride	<0.76	5.1 R	2.0 R	<3.8	<0.75	13 R
Acetone	6.8 R	<4.0	79 R	<7.6	3.4 R	2.1 R
2-Butanone	7.0 R	10 R	<5.0	<7.6	10 R	2.5 R
1,1,1 Trichloroethane	<0.76	<2.0	<2.5	<3.8	<0.75	<0.95
Vinyl Acetate	<1.5	<4.0	<5.0	<7.6	<1.5	<1.9
1,1,2,2 Tetrachloroethane	<0.76	<2.0	<2.5	<3.8	<0.75	<0.95
Toluene	<0.76	1.3 JR	<2.5	<3.8	<0.75	<0.95
Chlorobenzene	22	26 ER	<2.5	14	<0.75	<0.95
Ethylbenzene	0.45 JR	0.83 JR	<2.5	<3.8	<0.75	<0.95
Trichloroethene	<0.76	<2.0	<2.5	<3.8	<0.75	<0.95
1,2-Dichloroethene (Total)	<0.76	<2.0	<2.5	<3.8	<0.75	<0.95

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
J = The result is an estimate. The reported result is below the established analytical detection limit
E = The result is an estimate. The reported result exceeded the calibration range of the analytical instrument.
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	1BCTS-1* (DF=194.12)	1BCTS-1 (DF=222.02)	1BCTS-3 (DF=156.25)	1BCTS-3* (DF=225.87)	1BCTS-69* (DF=185.68)	1BCTS-69 (DF=222.02)
Methylene Chloride	12 R	<1.1	<0.78	10 R	31 R	<1.1
Acetone	1.9 R	<2.2	2.1 R	2.1 R	2.6 R	<2.2
2-Butanone	6.4 R	16 R	11 R	4.7 R	12 R	9.9 R
1,1,1 Trichloroethane	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
Vinyl Acetate	<1.9	<2.2	<1.6	<2.3	<1.9	<2.2
1,1,2,2 Tetrachloroethane	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
Toluene	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
Chlorobenzene	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
Ethylbenzene	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
Trichloroethene	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1
1,2-Dichloroethene (Total)	<0.97	<1.1	<0.78	<1.1	<0.93	<1.1

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria 1BCTS-69 is a field duplicate of 1BCTS-3
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	1BCTD-1* (DF=124.19)	1BCTD-1 (DF=161.71)	1BCTD-3* (DF=126.76)	1BCTD-3 (DF=159.24)
Methylene Chloride	17 ER	<0.81	8.2 ER	<0.80
Acetone	1.7 R	2.2 R	1.2 R	<1.6
2-Butanone	14 R	1600 R	2.9 R	11 R
1,1,1 Trichloroethane	<0.62	<0.81	<0.63	<0.80
Vinyl Acetate	<1.2	<1.6	<1.3	<1.6
1,1,2,2 Tetrachloroethane	<0.62	<0.81	<0.63	<0.80
Toluene	<0.62	<0.81	<0.63	<0.80
Chlorobenzene	<0.62	<0.81	<0.63	<0.80
Ethylbenzene	<0.62	<0.81	<0.63	<0.80
Trichloroethene	<0.62	<0.81	<0.63	<0.80
1,2-Dichloroethene (Total)	<0.62	<0.81	<0.63	<0.80

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
E = The result is an estimate. The reported result exceeded the calibration range of the analytical instrument.
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	2BCTS-1* (DF=112.58)	2BCTS-1 (DF=147.06)	2BCTS-3* (DF=105.99)	2BCTS-3 (DF=148.28)
Methylene Chloride	1.5 R	<0.74	31 R	<0.74
Acetone	<1.1	<1.5	3.9 R	<1.5
2-Butanone	3.3 R	11 R	11 R	11 R
1,1,1 Trichloroethane	<0.56	<0.74	<0.53	<0.74
Vinyl Acetate	<1.1	<1.5	<1.1	<1.5
1,1,2,2 Tetrachloroethane	<0.56	<0.74	<0.53	<0.74
Toluene	<0.56	<0.74	<0.53	<0.74
Chlorobenzene	<0.56	<0.74	<0.53	<0.74
Ethylbenzene	<0.56	<0.74	<0.53	<0.74
Trichloroethene	<0.56	<0.74	<0.53	<0.74
1,2-Dichloroethene (Total)	<0.56	<0.74	<0.53	<0.74

DF = Dilution Factor
[1] = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

TABLE E-1 (Continued)

Compound[1]	2BCTD-1 (DF=282.80)	2BCTD-1* (DF=288.08)	2BCTD-1RE* (DF=288.08)	2BCTD-4 (DF=160.26)	2BCTD-4* (DF=394.48)
Methylene Chloride	<1.4	14 R	10 R	<0.80	48 R
Acetone	<2.8	<2.9	3.6 R	<1.6	5.3 R
2-Butanone	19 R	15 R	16 R	11 R	28 R
1,1,1 Trichloroethane	<1.4	<1.4	<1.4	<0.80	<2.0
Vinyl Acetate	<2.8	<2.9	<2.9	<1.6	<3.9
1,1,2,2 Tetrachloroethane	<1.4	<1.4	<1.4	<0.80	<2.0
Toluene	<1.4	<1.4	<1.4	<0.80	<2.0
Chlorobenzene	<1.4	<1.4	<1.4	<0.80	<2.0
Ethylbenzene	<1.4	<1.4	<1.4	<0.80	<2.0
Trichloroethene	<1.4	<1.4	<1.4	<0.80	<2.0
1,2-Dichloroethene (Total)	<1.4	<1.4	<1.4	<0.80	<2.0

DF = Dilution Factor
† = Compounds which were not detected at any of the sampling locations are not listed above
R = The results have been rejected based on EPA CLP data validation criteria
* = The sample was preserved with methanol to prevent the loss of volatile organic compounds into the sample jar headspace.

PATERSON

PLANK

ROUTE 17

NJ TRANSIT

OFFSITE

OFF-SITE CHANNEL

NORTH DITCH

APPROXIMATE PROPERTY BOUNDARY

PROPERTY BOUNDARY FOLLOWS MID CHANNEL

ACKERMAN'S CREEK

CULVERT

OFF-SITE CHANNEL

OFFSITE

MURRAY HILL PARKWAY

BERRY'S CREEK

PROPERTY BOUNDARY FOLLOWS MID CHANNEL

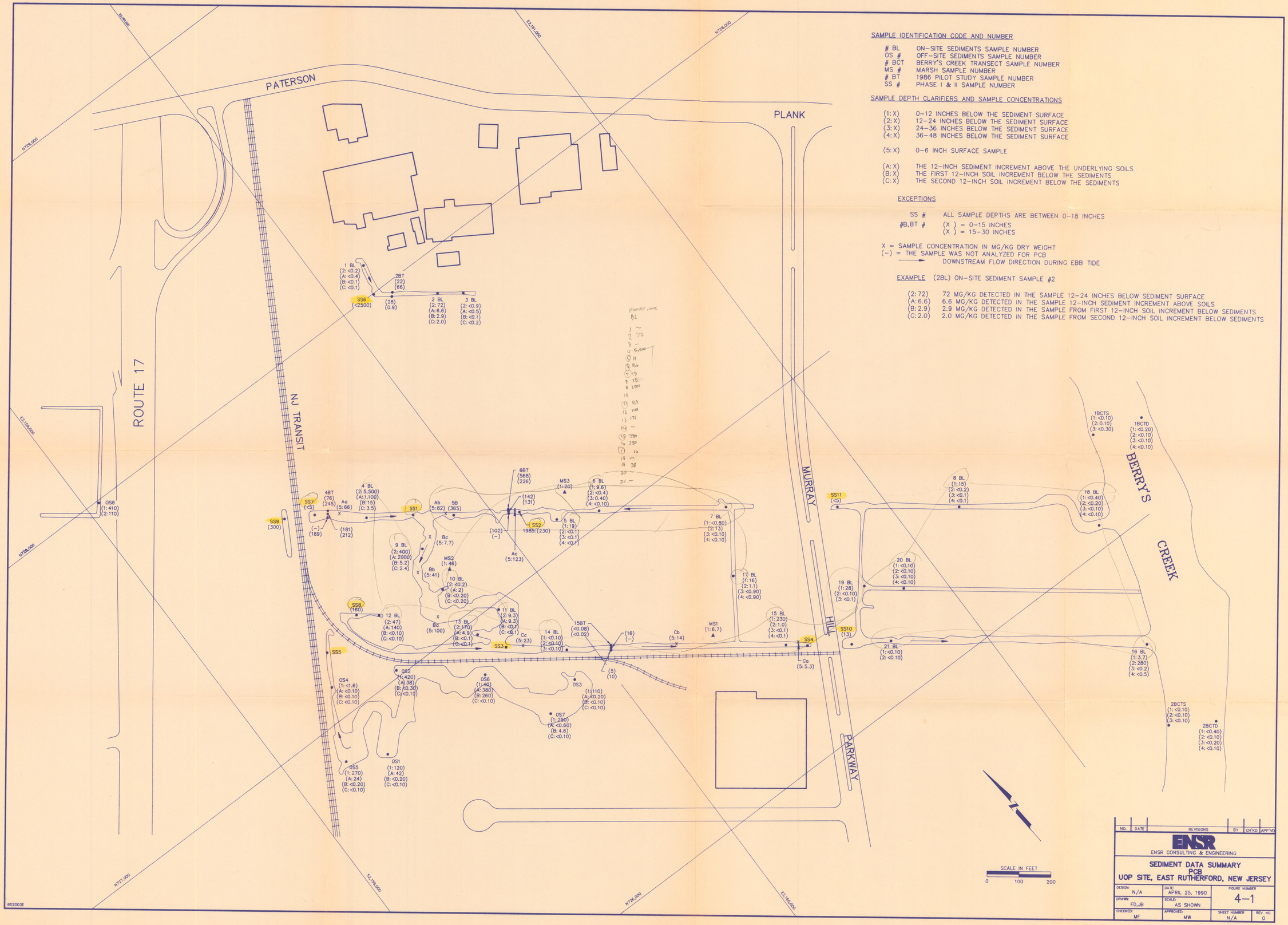
1 2 3 4 5 6 7

SCALE IN FEET
0 100 200

ENSR CONSULTING & ENGINEERING

STREAM CHANNEL AND SAMPLING LOCATIONS
UOP SITE, EAST RUTHERFORD, NEW JERSEY

DESIGN N/A	DATE APRIL 25, 1990	FIGURE NUMBER 3-1
DRAWN FD_JB	SCALE AS SHOWN	
CHECKED MF	APPROVED MF	EDP/CAD FILE NO. N/A



SAMPLE IDENTIFICATION CODE AND NUMBER

# BL	ON-SITE SEDIMENTS SAMPLE NUMBER
OS #	OFF-SITE SEDIMENTS SAMPLE NUMBER
# BCT	BERRY'S CREEK TRANSECT SAMPLE NUMBER
MS #	MARSH SAMPLE NUMBER
# BT	1986 PILOT STUDY SAMPLE NUMBER
SS #	PHASE I & II SAMPLE NUMBER

SAMPLE DEPTH CLARIFIERS AND SAMPLE CONCENTRATIONS

(1: X)	0-12 INCHES BELOW THE SEDIMENT SURFACE
(2: X)	12-24 INCHES BELOW THE SEDIMENT SURFACE
(3: X)	24-36 INCHES BELOW THE SEDIMENT SURFACE
(4: X)	36-48 INCHES BELOW THE SEDIMENT SURFACE
(5: X)	0-6 INCH SURFACE SAMPLE
(A: X)	THE 12-INCH SEDIMENT INCREMENT ABOVE THE UNDERLYING SOILS
(B: X)	THE FIRST 12-INCH SOIL INCREMENT BELOW THE SEDIMENTS
(C: X)	THE SECOND 12-INCH SOIL INCREMENT BELOW THE SEDIMENTS

EXCEPTIONS

SS #	ALL SAMPLE DEPTHS ARE BETWEEN 0-18 INCHES
#B,BT #	(X) = 0-15 INCHES (X) = 15-30 INCHES

X = SAMPLE CONCENTRATION IN MG/KG DRY WEIGHT
(-) = THE SAMPLE WAS NOT ANALYZED FOR PCB
→ DOWNSTREAM FLOW DIRECTION DURING EBB TIDE

EXAMPLE (2BL) ON-SITE SEDIMENT SAMPLE #2

(2: 72)	72 MG/KG DETECTED IN THE SAMPLE 12-24 INCHES BELOW SEDIMENT SURFACE
(A: 6.6)	6.6 MG/KG DETECTED IN THE SAMPLE 12-INCH SEDIMENT INCREMENT ABOVE SOILS
(B: 2.9)	2.9 MG/KG DETECTED IN THE SAMPLE FROM FIRST 12-INCH SOIL INCREMENT BELOW SEDIMENTS
(C: 2.0)	2.0 MG/KG DETECTED IN THE SAMPLE FROM SECOND 12-INCH SOIL INCREMENT BELOW SEDIMENTS

NO.	DATE	REVISIONS	BY	CHK'D	APP'VD

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SEDIMENT DATA SUMMARY
PCB
UOP SITE, EAST RUTHERFORD, NEW JERSEY

DESIGN: N/A	DATE: APRIL 25, 1990	FIGURE NUMBER 4-1
DRAWN: FD,JB	SCALE: AS SHOWN	
CHECKED: MF	APPROVED: MW	SHEET NUMBER N/A / REV. NO. 0